User's Manual

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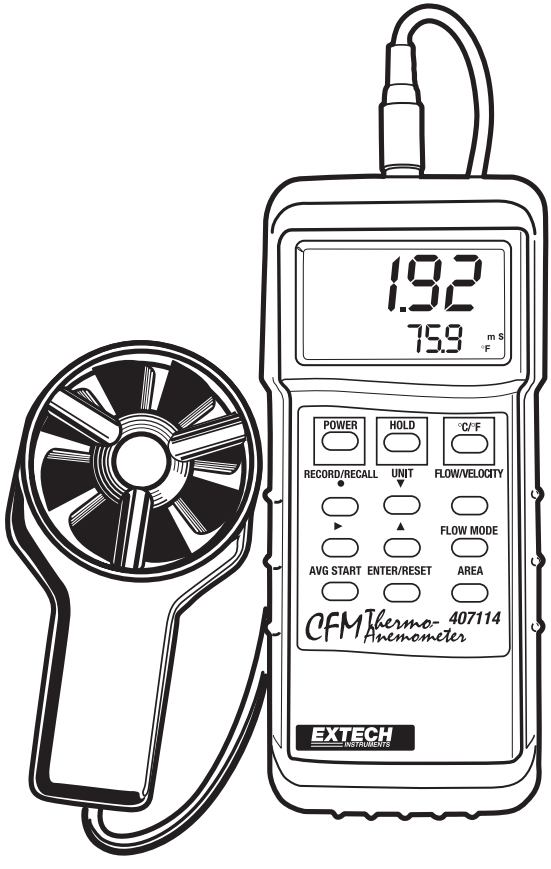
EXTECH INSTRUMENTS

CFM Thermo Anemometer

Air Velocity, Air Flow, and Temperature

Model 407114



Specifications

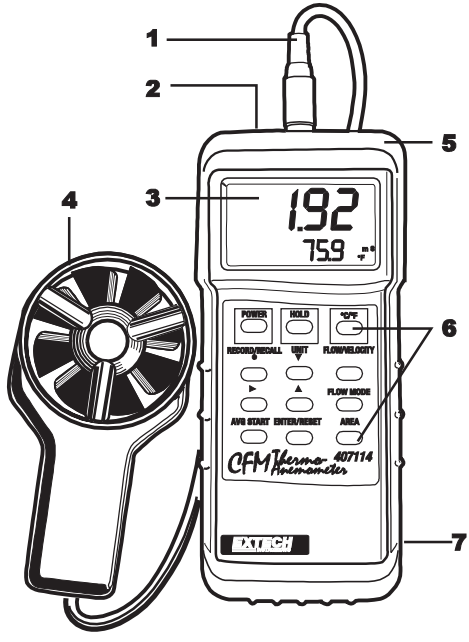
General Specifications

Circuit	Custom LSI microprocessor circuit
Display	Dual function 0.5" (13 mm) 4-digit LCD
Measurement units	Air Velocity: m/s, km/h, ft/min, knots, mph; Air Flow: CMM (m^3/min); CFM (ft^3/min); Temp: °C & °F
Data hold	Freezes displayed reading
Sampling rate	1 reading per second approx.
Sensors	Air velocity/flow sensor: Conventional angled vane arms with low-friction ball bearing. Temperature sensor: Precision thermistor
MAX/MIN Memory	Record and view Maximum and Minimum readings
Automatic Power off	Auto shut off after 15 minutes to preserve battery life
Data Output	RS 232 PC serial interface with 16-bit data stream
Operating Temperature	32°F to 122°F (0°C to 50°C)
Operating Humidity	Max. 80% RH
Power Supply	9V battery
Power Current	Approx. 8.3 mA DC
Weight	0.84 lbs. (381g) including battery & probe
Dimensions	Main instrument: 7.1 x 2.8 x1.3" (180 x 72 x 32mm) Sensor Head: 72mm Diameter

Range Specifications

Air Velocity	**Range**	**Resolution**	**Accuracy** (% rdg)
m/s (meters per sec)	0.40 - 25.00 m/s	0.01 m/s	± (2% + 0.2 m/s)
km/h (kilometers/hour)	1.4 - 90.0 km/h	0.1 km/h	± (2% + 0.8 km/hr)
ft/min (feet per minute)	80 – 4921 ft/min	1 ft/min	± (2% + 40 ft/m)
mph (miles per hour)	0.9 – 55.9 mph	0.1 mph	± (2% + 0.4 MPH)
knots (nautical MPH)	0.8 to 48.6 knots	0.1 knots	± (2% + 0.4 knots)
Air Flow	**Range**	**Resolution**	**Area**
CMM (cubic meters/min)	0-999,900 m^3/min	0.001 to 100	0 to 9,999m^2
CFM (cubic ft/min)	0-999,900 ft^3/min	0.001 to 100	0 to 9,999ft^2
Air Temperature	**Range**	**Resolution**	**Accuracy**
	32 - 122 ^oF (0 - 50 ^oC)	0.1 ^oF/C	1.5 ^oF (0.8 ^oC)

Meter Description

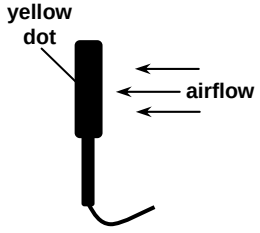


1. Sensor plug. Can be inserted in the sensor jack from only one direction. Ensure proper orientation before exerting force to plug in the sensor.
2. PC Interface jack (RS-232). For use with the interface cable provided in the optional 407001 PC Data Acquisition kit.
3. LCD Display for Air Velocity, Air Flow, and Temperature. Units of measure and user alerts are also displayed on the LCD.
4. Vane Sensor. Hold the sensor in the flow of air to initiate a reading.
5. Protective rubber holster. Must be removed to access the rear battery compartment.
6. Keypad (see below)
   - **POWER** Press to turn the meter ON or OFF
   - **HOLD** Press to freeze the displayed reading. Press again to unlock display
   - **C/F** Press to select the unit of measure for Temperature readings
   - **RECORD/RECALL** ● Used to store the highest, lowest, and average readings for later recall. Refer to the Operation section of this manual for more details. This button also functions as the DECIMAL point when programming.
   - **UNIT** ▼ Press to select the unit of measure for Air Velocity. This button also functions as the DOWN ARROW button when programming
   - **FLOW/VELOCITY** Press to select the mode of operation. In FLOW mode, the meter displays air *volume*. In VELOCITY mode, the meter displays air *speed*.
   - ▶ RIGHT Arrow button. Used when programming.
   - ▲ UP Arrow button. Used when programming.
   - **FLOW MODE** Press to select the Normal, AVG, or 2/3 MAX Air Flow operational mode. Refer to the Operation section of this manual for more details.
   - **AVG/START** In the FLOW mode, press to store a reading in the AVERGGE utility. Up to 20 readings can be averaged. Refer to the Operation section of this manual for more details.
   - **ENTER/RESET** Used in the Flow mode while entering the duct area. Refer to the Operation section of this manual.
   - **AREA** Used when manually entering the area of a duct. Refer to the Operation section of this manual.
7. Battery compartment located on the back of the instrument. The rubber protective jacket must be removed from the meter to access the compartment.

Operation

Air Velocity Measurements

1. Connect the sensor to the sensor input jack on top of the meter.
2. Turn on the meter using the POWER button.
3. Select the VELOCITY function using the VEL/FLOW button. The LCD will display **VEL** when the velocity mode is selected.
4. Select the desired temperature units using the C/F select button. The LCD will reflect the current unit selection.
5. Select the desired air velocity units using the UNIT button. The LCD will reflect the current unit selection.
6. Place the sensor in the air current with the yellow dot on the exhaust side of the vane (see diagram)
7. View the air velocity and temperature readings on the LCD Display. The large main LCD display shows the Air Velocity reading. The lower LCD sub-display shows the temperature reading.



Data Hold Feature

1. While taking measurements, press the HOLD button to freeze the LCD reading for later viewing.
2. The **DH** indicator will appear on the LCD when the display is in Data Hold mode.
3. Press HOLD again to return to normal operation.

Maximum and Minimum Recording

The 407114 allows the user to record and view the highest (MAX) and lowest (MIN) readings.

1. Press the RECORD/RECALL button once. The **REC** indicator will appear on the display and the meter will begin keeping track of the MAX and MIN values.
2. To view the MAX reading, press RECORD/RECALL again. The **MAX** indicator along with the maximum reading will appear on the LCD display.
3. Press RECORD/RECALL again to view the minimum value, the **MIN** indicator along with the minimum reading will appear on the LCD display.
4. To return to normal operation, press and hold the RECORD/RECALL button for approx. 3 seconds. The display indicators **REC**, **MAX**, and **MIN** will disappear.

Air Flow Measurements (CMM / CFM)

1. Connect the sensor to the sensor input jack on top of the meter.
2. Turn on the meter using the Power button.
3. Select the FLOW mode using the FLOW/VELOCITY button. The LCD will display **FLOW** when the Flow function has been properly selected.
4. Select the desired air flow units: CMM (cubic meters per minute) or CFM (cubic feet per minute) using the UNIT button. The LCD will reflect the selection.
5. Press the AREA button to begin entering the area in m^2 or ft^2. Use the ▲ button to increment the flashing digit, use the ▼button to decrement the flashing digit, use the ▶ button to select the next digit, and use the RECORD/RECALL● button to set the decimal point. Press the ENTER/RESET button when the area has been entered. The bottom display (normally used for the temperature display) will indicate the area entered in ft^2 or m^2. The main LCD displays the air flow in CFM (cubic feet per minute) or CMM (cubic meters per minute). If the CFM or CMM reading exceeds 9999, use the displayed X10 or X100 multiplier to calculate the reading.
6. For Air Flow measurements, three modes apply: The normal (default mode) where the actual flow is indicated, and the two modes described below: Press the FLOW/MODE button to select one of the two modes listed below:

   2/3V MAX MODE: LCD displays 2/3 the measured value.

   AVG MODE: Up to 20 readings can be taken separately and averaged. Select the AVG mode via the FLOW/MODE button and then press the AVG/START button to take a reading. Up to 20 readings can be taken and averaged. The lower LCD display provides a 1 to 20 counter and each time a reading is taken the counter is incremented. The main LCD displays the averaged air flow.
7. Note that the temperature function is not active in the Air Flow mode.

Automatic Power OFF

The Model 407114 turns off automatically after 15 minutes of operation. This feature was designed to conserve battery power. Note that when the meter is in the RECORD/RECALL mode, the Automatic Power OFF feature is disabled.

Battery Replacement

When **LBT** appears on the LCD, the 9V battery must be replaced.

1. Disconnect the sensor and the RS-232 PC Interface cable from the meter.
2. Remove the meter's rubber protective jacket
3. Use a flat blade screwdriver or a coin to open the rear battery compartment
4. Replace the 9V battery
5. Close the battery compartment and replace the meter's protective jacket

RS-232 PC Interface

The 407114 is equipped with a 3.5mm phono jack (meter top) for connection to a PC. To obtain the Model 407001 Windows™ data acquisition kit, contact Extech Instruments. The kit includes a cable that connects the meter to a PC. Instructions for use are provided with the 407001 kit.

Useful Equations and Conversions

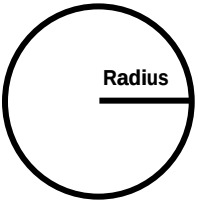
Area equation for rectangular or square ducts

Height (H)

Width (W)

Area (A) = Width (W) x Height (H)

Area equation for circular ducts



Area (A) = π x r^2

Where π = 3.14 and r^2 = radius x radius

Cubic equations

CFM (ft^3/min) = Air Velocity (ft/min) x Area (ft^2)

CMM (m^3/min) = Air Velocity (m/sec) x Area (m^2) x 60

NOTE: Measurements made in *inches*
must be converted to *feet* or *meters* before using the above formulae.

Unit of Measure Conversion Table

	m/s	ft/min	knots	km/h	MPH
1 m/s	1	196.87	1.944	3.6	2.24
1 ft/min	0.00508	1	0.00987	0.01829	0.01138
1 knot	0.5144	101.27	1	1.8519	1.1523
1 km/h	0.2778	54.69	0.54	1	0.6222
1 MPH	0.4464	87.89	0.8679	1.6071	1

Back to the 407114 Product Info Page

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